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FIRST JURASSIC ACTINOPTERYGIAN FISH FROM QUEENSLAND

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ABSTRACT

Seven fragmentary specimens of ray-finned, possibly neopterygian, fish, which represent the first fish of this period in the State, are described from two localities in the Middle Jurassic Walloon Coal Measures of Balgowan Colliery, southeast Queensland. Six of the fish specimens from Balgowan Tunnel are preserved mainly as carbonaceous impressions in fine grained grey lithic sandstone. Remnants of the original scales, scale tissue and a presumed dorsal fin are present in the other specimen which comes from the Rosalie Workings, Balgowan. The significance of the record is assessed by comparison with other Australian Jurassic fish from New South Wales.

INTRODUCTION

The Jurassic coal measures of the Ipswich coalfield have been investigated thoroughly since around the turn of the century (Gould 1968). In 1951 Jack Tunstall Woods, then geological assistaut at the Queensland Museum, collected six specimens from the coal measures of Balgowan Tunnel, Balgowan Colliery, 19 km (12 miles) north of Oakey, which he thought might be fish remains; these were the first possible fish remains of this age to be found in the State. When reviewing the Queensland fossil fishes, Turner (1982) did not include these specimens because they were thought at that time to be plant material. During a subsequent search in the collections of the Geological Survey of Queensland the junior author came across a fish specimen from the Walloon Coal Measures which closely resembles the material in the Queensland Museum. This specimen was collected by Mr Godfrey, the Colliery Manager, in March 1952. The seven specimens are described here for the first time and figured in Plate 1.

AGE OF FISH-BEARING BEDS

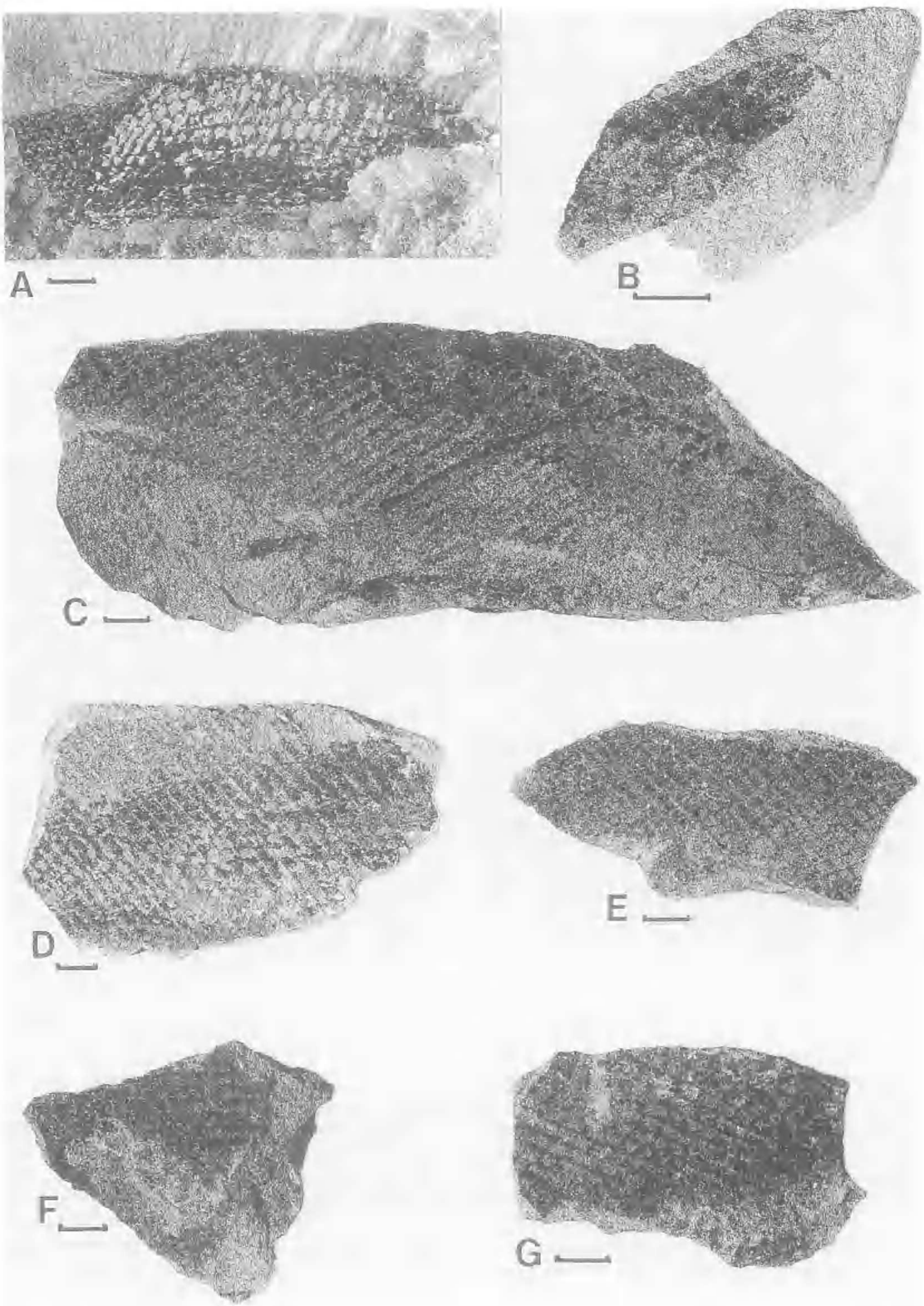
Mengel (1963) reviewed the geology and coal resources of Balgowan Colliery. However, little has been published on the flora and fauna of the coal measures exposed in these particular mines. With the exception of numerous, mainly theropod, dinosaur tracks found in roof shales (for review of literature see Gould 1974 and Molnar 1982), there are no other records of fossil vertebrates from Balgowan Colliery; to our knowledge no other macro- or microfossils, plant or invertebrate, are recorded from this site.

The coal measure succession at Balgowan Colliery is part of the Walloon Coal Measures (Day *et al.* 1983) which has a widespread surface and subsurface distribution in Queensland (Gould 1968, Cranfield *et al.* 1976). Based on palynological evidence, the age of this formation is now considered to be Middle Jurassic (U. Bajocian – L. Callovian) (de Jersey and Paten 1964). The Walloon Coal Measures megaflora of Queensland was reviewed by Gould (1974, 1981). It contains bryophytes, arthrophytes, pteridophytes and gymnosperms, of which conifers are dominant; more detailed research on most taxa is needed.

DESCRIPTION OF MATERIAL

The specimens (Plate 1) are all partial body sections covered with scales and described below. Specimens QM F13632–6 were all found in association but it seems unlikely that they all originally belonged to one fish.

Specimen GSQ F12975 (Plate 1A) is the only specimen with a natural outline preserved; the head region and caudal fin are missing. Imbrication of the scales on the right side of GSQ F12975 indicates the anterior end of the fish which is broken off behind the operculum. This specimen has a distinct convex dorsal margin and two-thirds of the way along this surface from the front there is a small dorsal fin making an angle of about 20° with the flank. This fin originates at about the level of oblique scale row 27 of the 39–40 preserved oblique scale rows. The scales are rhombic, the largest in the mid-flank region having a maximum (oblique dorso-ventral) length of 5 mm and a width of about 2.5–3mm; smaller scales occur to front


A
B
C
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G

and rear. Behind the anterior edge of the dorsal fin there is a distinct caudal inversion of scales. The squamation presents a simple pavement of these rhombic scales, which appear to have only a thin covering of shiny semi-opaque tissue; this tissue is preserved over the surface of the scales of much of this specimen unlike those from Balgowan Tunnel. There is no scale ornament. The scales in the oblique rows are offset about midway along their length. The posterior border of the imbricated scales is straight and no sign of peg and socket articulation can be seen. Only the lower portions of six rays are exposed in the dorsal fin and no segmentation is visible. There appears to be at least one large fulcral scale preceding the dorsal fin. Further modified scales are not obvious but at least two are present in the base of the fin. Eight fringing fulcra are preserved. About six horizontal scale rows down from the dorsal surface there is an intermittent raised ridge in the squamation which may be the lateral line, or possibly an artefact of fossilization; no lateral line scales can be distinguished.

Specimen QM F13632 (Plate 1C) also has large rhombic scales arranged in about 38 oblique rows. The scales, however, are not so offset in this specimen. No original tissue is preserved and the scales appear as dark brown carbonized stains, or sandstone rhombs with carbonized outlines. Pieces of plant stem and comminuted plant debris surround the squamation.

Specimen QM F13633 (Plate 1F) is a small patch of squamation made up to about ten incomplete scale rows. Specimens QM F13634a and b (Plate 1E and G), QM F13635 and QM F13636 (Plate 1B and D) are also fragmentary, made up of about 19–20, 15, 5 and 33 oblique scale rows respectively. Specimen QM F13636 exhibits the maximum depth of squamation (Table 1).

The fish specimens are all thought to be actinopterygians because of the presence of rhombic scales and the rayed fin. The fishes, which bear relatively thin scales which may or may not be formed of a surface layer of dentine or enameloid, probably belong to one of the lower actinopterygian groups. The general form of the Queensland specimens is similar to the neopterygian halecostome, *Hulettia*, from the Middle Jurassic (Bathonian) of the western USA, recently described by Schaeffer and Patterson (1984). However the preservation of the Queensland specimens is relatively poor, and the general resemblance of the squamation and dorsal fin to that of *Hulettia* is almost certainly no more than a superficial convergence or similarity of primitive characteristics.

COMPARISON WITH THE TALBRAGAR FAUNA

The only other verified Jurassic fish fauna in Australia is that from the Talbragar Fish Beds of New South Wales, where a small fauna was discovered in the last century in association with a suite of plant remains (e.g. White 1981a, b). David and Pittman (1895) regarded the Talbragar Beds as equivalent to what they called the Ipswich Coal Measure Series of Queensland (which now excludes the Walloon Coal Measures). Woodward (1895) in his initial assessment of the fish fauna estimated that the fish were of Jurassic age in affinity, 'not earlier than Lias'. The current assessment of the age of these beds is rather broad, being either Middle (Woodward 1895; White 1981a; Schaeffer and Patterson 1984) or Upper Jurassic (White 1981b; Long and Turner 1984).

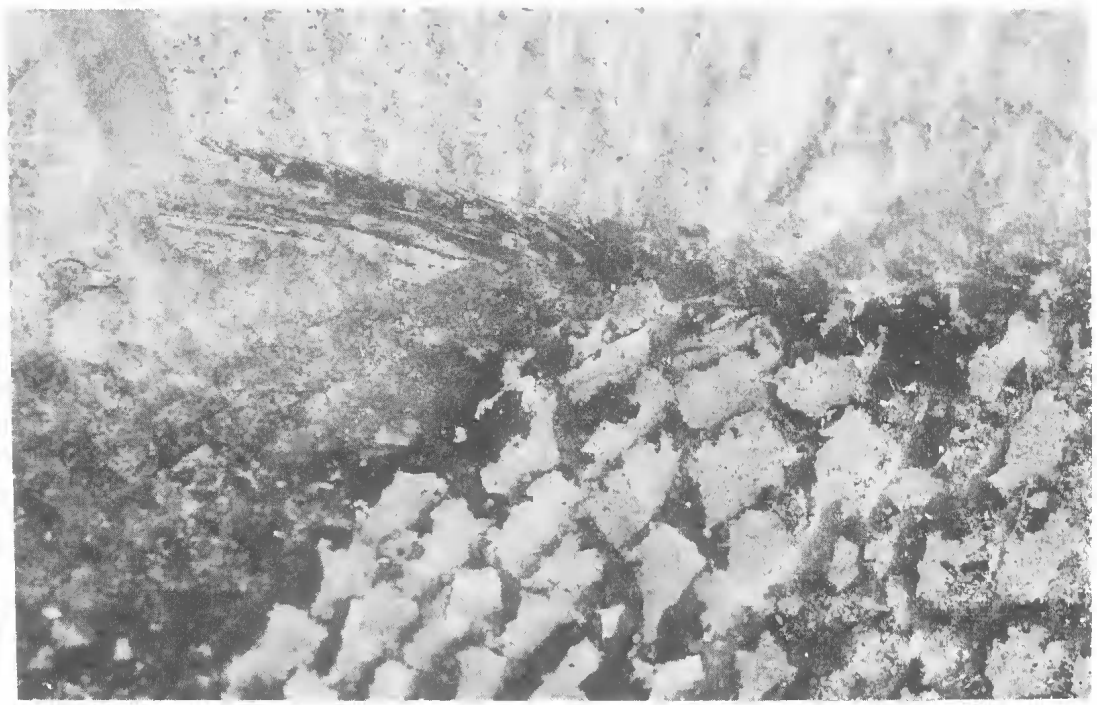
The fauna is accepted as non-marine because only fish, plants and one insect have been found in the series of fine-grained silicified shales. White (1981b) described the environment at Talbragar as a lush kauri pine (*Agathis*) forest in montane dry rain-forest country surrounding a reasonable-sized lake.

The fish fauna includes a coelacanth, palaeonisciforms, semionotiforms, pholidophoridiforms and possible leptolepidids, although the assignment of some of these species is tenuous or doubtful (e.g. Nybelin 1974, p. 170). The faunal list is as follows (from Hills 1958 and Schaeffer and Patterson 1984):

PLATE 1: Jurassic actinopterygian fish. **A**, GSQ F12975 Squamation of flank scales and part of dorsal fin, **B**, QM F13635 Small patch of flank scales. **C**, QM F13632 Large area of flank scales. **D**, QM F13636 Small patch of flank scales. **E**, QM F13634a Small patch of flank scales. **F**, QM F13633 Small patch of flank scales. **G**, QM F13634b Small patch of flank scales. Scale bars = 10 mm.

TABLE 1: Measurements of specimens in mm.

Registration No.	Maximum length	Maximum depth
GSQ F12975	115	36
QM F13632	173	45
QM F13636	103	59



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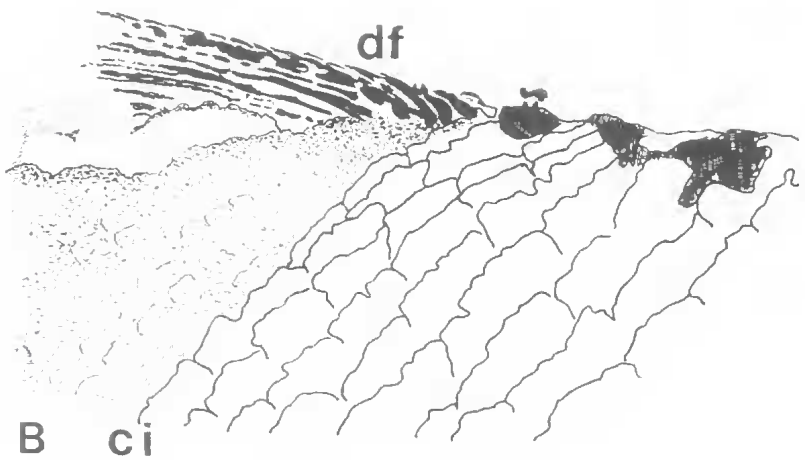

PLATE 2. Jurassic actinopterygian fish. Detail of GSQ F12975. **A**. Close up of flank scales and presumed dorsal fin, photomicrograph × 4. **B**. Diagram of the same area to illustrate the dorsal fin (df) and the caudal inversion (ci), approximately × 3.3. Anterior to right in both cases.

coelacanth indet.
Coccolepis australis Woodward 1895
Uabryichthys latus Wade 1942
Aetheolepis mirabilis Woodward 1895
Aphenelepis australis Woodward 1895
Archaeomaene tenuis Woodward 1895
Madariscus robustus (Woodward 1895)
'*Leptolepis*' *talbragarensis* Woodward 1895

Of these forms only one shows a resemblance to the new Queensland material in the form of its scales. This is the semionotid *Aphenelepis* which has rhombic scales. They are not identical however, to those of the new fish, as they bear slightly radiating 'coarse crimping' (Woodward 1895). All the other forms at Talbragar have cycloidal scales. The general form of *Aphenelepis* also differs in that it is relatively short-bodied with only about 17 oblique scale rows to the origin of the dorsal fin. However, Woodward did note the abrupt change in scale size posterior to the dorsal fin origin, a feature also seen in the GSQ specimen.

THE ENVIRONMENT

The flora of the Walloon Coal Measures is similar to that in the Talbragar Fish Beds. It includes lycopods, horsetails, ferns, pteridosperms, benettitaleans, numerous conifers, cycads, and pentoxylales (Gould 1974, 1981; White 1981). The Queensland fish, like the Talbragar fauna, were probably also living in a lake, but one possibly more low-lying than that at Talbragar being associated with nearby peat-forming swamps. Gould (1981) thought that the peat, which eventually became coalified, was autochthonous. The presence of podocarp and araucarian conifers forming the dominant plant group in the Walloon Coal Measures flora, indicates a distinctive southern hemisphere (Gondwanan) plant assemblage suggesting a moist temperate climate (Gould 1981). Gould (1968) also mentioned that the clay component of the shales in the Walloon Formation was koalinite, montmorillonite and bentonite; the latter would incidate possible nearby volcanic activity (e.g. Howell 1962). The ejection of large volumes of volcanic ash into the water bodies would certainly have detrimentally affected the fish population.

CONCLUDING REMARKS

Schaeffer and Patterson (1984) in their recent review of Jurassic fishes summarized all the available information on Jurassic marine and non-marine fish assemblages (see their tables 3 and 4 and Fig. 39). They also stressed that it would be desirable to search outside Europe, where the faunas are comparatively well-known, for new insights into the phylogeny and palaeobiogeography of Jurassic fishes. Although the new occurrence of Jurassic fish in Australia does not afford much fresh information towards our understanding of the relationships of Australian Jurassic fish to those elsewhere it does pinpoint another example of a non-marine assemblage. It will be well worthwhile investigating further the Jurassic coal measure sequences in Queensland for better material which might fulfill Schaeffer and Patterson's criteria.

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